

Changes in Liver Metabolic Gene Expression from Radiation Exposure

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Increased exposure to radiation is one physiological stressor associated with spaceflight. While known to alter normal physiological function, how radiation affects metabolism of administered medications is unclear. Crew health could be affected if the actions of medications used in spaceflight deviated from expectations formed during terrestrial medication use. Three different doses of gamma radiation (50 mGy – 6.05 Gy) and a sham were administered to groups of 6 mice each, and after various intervals of recovery time, liver gene expression was measured with RT-qPCR arrays for drug metabolism and DNA repair enzymes. Results indicated ~65 genes of the 190 tested were significantly affected by at least one of the radiation doses. Many of the affected genes are involved in the metabolism of drugs with hydrophobic or steroid-like structures, maintenance of redox homeostasis and repair of DNA damage. Most affected genes returned to near control expression levels by 7 days post-treatment. With 6 Gy exposure, metallothionein expression was 132-fold more than control at the 4 hr time point, and fell at each later time point (11-fold at 24 hrs, and 8-fold at 7 days). In contrast, Cyp17a1 showed a 4-fold elevation at 4 hrs after exposure and remained constant for 7 days. Treated tissue courtesy of H. Wu, NASA JSC via DOE grant. Analysis above, JSC Human Research Program to V. W. ; C.P.P, MN Space Grant.